DJI Phantom VSM User Guide

UgCS 2.3.491

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1 DJI VSM User Guide

1.1 First time vehicle connection

See Disclaimer.

Supported multicopter autopilots:

Autopilot	Supported
A2	Yes
Wookong-M	Yes
Naza-M V2	Yes
Naza-M Lite	No

(Helicopter autopilots are not supported)

Supported RTF products:

Product	Supported
Phantom 2	Yes
Phantom 2 Vision	No
Phantom 2 Vision+	No
Phantom 1	No
Phantom FC40	No

(Helicopter autopilots are not supported)

Please follow these steps to connect a DJI vehicle to the UgCS:

1. To connect DJI vehicle to UgCS you need the 2.4G datalink

   (http://www.dji.com/product/2-4g-bluetooth-datalink). Direct USB cable to DJI vehicle cannot be used to connect it to UgCS.

2. For Windows setup you also need to download from DJI site and install driver for 2.4G datalink (http://download.dji-innovations.com/downloads/driver/DJI_WIN_Driver_-Installer.exe). This step is not required if you are running UgCS on Linux or Mac.

3. Before connecting the vehicle to UgCS, please ensure all autopilot settings (fail-safe, control mode switch, compass calibration) are configured accordingly via DJI Assistant software. Please consult user manual of your autopilot for details.

4. Once the drone is connected it should appear in vehicles list. Both Uplink and Downlink connections should be available. Press *Gain control* and *Edit* to select corresponding vehicle profile and change the default vehicle name to be convenient for you:

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Figure 1: New DJI vehicle

Vehicle profile needs to be assigned to allow mission planning with this vehicle. Image needs to be assigned to see vehicle location on the map.

1.2 Mission execution specifics

- Fail-safe settings in mission properties are ignored.

- DJI has the following harcoded fail-safe settings:

Condition	Behavior	Notes
On GPS signal loss	Land	Happens when there are less than 6 satellites visible for more than 20 seconds
On RC signal loss	Return to launch position	Default altitude is 20m. See vehicle User Manual for more information.
On low battery	Land	See vehicle User Manual for more information.

- Mission waypoint actions supported by DJI:

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Flight plan element / action	Support	Notes
Camera control	No	
Camera trigger	Yes	Only Single-shot camera mode is supported for A2 and Wookong autopilots when camera trigger is wired to General Purpose servo output see General Purpose servo action setup for details.
Wait	Yes	Only one wait action per waypoint is allowed.
Yaw	Partial	1) Only when hovering over the waypoint. Vehicle will always fly with nose pointing to next waypoint. 2) Only 1 Yaw action per Waypoint is supported. (In case of multiple yaw actions the last one will be used.) 3) For Yaw action to succeed it must be used together with "Wait" action.
Land	No	Vehicle will hover over the last waypoint until operator takes over the control.
Panorama	No	
Point Of Interest	No	
Camera by time	Yes	Supported for A2 and Wookong autopilots when camera trigger is wired to General Purpose servo output see General Purpose servo action setup for details.
Camera by distance	Yes	Supported for A2 and Wookong autopilots when camera trigger is wired to General Purpose servo output see General Purpose servo action setup for details.

1.3 Command execution specifics

Command	Support	Notes
ARM	No	
DISARM	No	
AUTOMODE	Yes	Take off and start the mission
MANUALMODE	No	
RETURNHOME	Yes	Vehicle will fly to preconfigured altitude (default is 20m) and return to launch position and land
TAKEOFF	No	
LAND	No	
EMERGENCYLAND	No	

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1.4 Command according

UGCS Client can show command buttons in different shades. You can always press all buttons disregarding of shade. Highlighted buttons suggest recommended commands, depending on vehicle current status.

Command according:

State	Button highlighted	Button shaded
Armed	AUTOMODE, Camera trigger, RETURNHOME	
Disarmed	AUTOMODE, Camera trigger, RETURNHOME	

1.5 Telemetry information specifics

- Vehicle state (armed/disarmed) is controlled from RC transmitter. (Vehicle is armed automatically when "Auto Mode" command is issued)
- Flight mode meaning
  - Auto: Vehicle is executing mission or is returning to launch position.
  - Manual: Vehicle is holding position.

Note

User can take over the control from any mode at any time by flipping the "Mode Switch" on RC transmitter from "GPS" to "ATTI" to "GPS"

1.6 Fail-safe actions

Fail-safe actions can be set only in DJI Assistant software.

1.7 Waypoint turn types

There are 3 different routing planning modes for DJI autopilots: fixed-point turn mode (Stop and Turn), coordinated turn mode (Bank Turn) and adaptive coordinated turn mode (Adaptive Bank Turn). You can choose turn type for each Waypoint, Circle, Perimeter. The default turn mode in the system is Stop and turn.

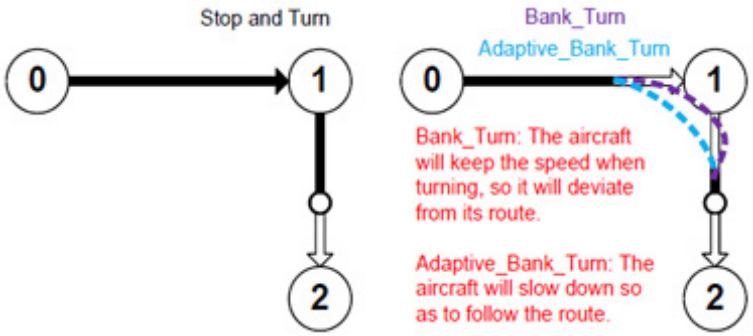

Figure 2: Turn type

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Turn type	Support	Notes
Stop and Turn	Yes	Aircraft flies to the first fixed point accurately, stays at the fixed point and then flies to the next fixed point.
Bank Turn	Yes	The route of aircraft is calculated with turning speed and turning angle. The aircraft would fly from one point to another point without stopping.
Adaptive Bank Turn	Yes	It is almost the same performance with Bank Turn mode. But the flight routine will be more accurately detailed with a planned flight routine in this mode.

You can find more information about turning mode and supporting autopilots on the site http://wiki.dji.-com/.

1.8 General Purpose servo action setup

DJI A2 and Wookong autopilots support general purpose servo action. It can be used to trigger camera.

For that you will need to:

- have a device to trigger camera via PWM signal (For example: http://copter.ardupilot.-com/wiki/common-pixhawk-auto-camera-trigger-without-chdk/#22_IR_trigger-_device)
- connect it to general purpose servo output on autopilot:
  - A2: output "F2"
  - Wookong: output "F1"

  (Consult DJI autopilot manual for more details on how to use GP servo outputs.)
- configure the servo action in configuration file. Add the "vehicle.dji.trigger_action" parameter to vsm-dji.conf, see Configuring trigger_action parameters in vsm-dji.conf below.
- create a mission with waypoint actions Camera-mode Single-shot.

1.8.1 Configuring trigger_action parameters in vsm-dji.conf

Parameter trigger_action accepts seven comma separated integers.

Parameter number	Range	Description
1	-1000..1000	Default servo position
2	-1000..1000	1st servo position on action
3	0..9	seconds to hold 1st servo position
4	-1000..1000	2nd servo position on action
5	0..9	seconds to hold 2nd servo position
6	-1000..1000	3rd servo position on action
7	0..9	seconds to hold 3rd servo position

If your trigger needs only 1 servo position change then last 4 parameters can be omitted.

Example:

The following line in vsm-dji.conf:

```
vehicle.dji.trigger_action = 100, -200, 1
```

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Produces the behavior:

- Autopilot will keep the GP servo at position 100 during the whole mission.
- On each waypoint which has the "Camera-mode: Single-shot" action the connected servo will:
  - move to position -200,
  - wait 1 second,
  - move back to position 100.

1.9 GoPro video link

Vehicle can be configured to carry GoPro camera. In that case live video stream can be obtained via UgCS video streamer component which must be running on the host which is connected to GoPro WiFi access point.

1.10 Configuration file

Default configuration file of the DJI VSM suits most needs and it is generally not necessary to modify it.

Configuration file location:

- **On Microsoft Windows:**

```
C:\Program Files (x86)\UgCS\vsm-dji\vsm-dji.conf
```

- **On GNU/Linux:**

```
/etc/opt/ugcs/vsm-dji.conf
```

- **On Apple OS X:**

```
/Users/[user name]/Library/Application Support/UGCS/configuration/vsm-dji.conf
```

1.10.1 Common parameters

All VSMs share a common set of configuration file parameters described in Common configuration file parameters. DJI VSM configuration file prefix is:

```
vehicle.dji
```

1.10.2 Serial port configuration

Mandatory. This is the serial port name which appears when 2.4G datalink USB cable is plugged in. At least one serial port definition should be present, otherwise VSM will not try to connect to the vehicle.

- **Name:** vehicle.dji.serial_port
- **Description:** Serial port configuration, for more details see Serial port configuration. Default DJI port communication speed is 115200 bps.
- **Example:**

```
vehicle.dji.serial_port.1.name = com1
vehicle.dji.serial_port.1.baud = 115200
```

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1.10.3 Waypoint turn type

Optional. Used to override the turn type for all waypoints in uploaded mission. Please see DJI GS manual for detailed explanation of turn types.

- **Name:** vehicle.dji.turn_type_override
- **Pssible values:** stop, bank, adaptive_bank
- **Default:** stop
- **Example:**

```
vehicle.dji.turn_type_override = adaptive_bank
```

1.11 Common configuration file parameters

VSM configuration file is a text file specified via command line argument - *-config* of the VSM application. Example:

```
--config /etc/opt/ugcs/vsm-ardupilot.conf
```

Each configuration parameter is defined as a line in the configuration file with the following structure:

```
name1.name2....nameX = value
```

where name1, name2 ... nameX are arbitrary names separated by dots to divide a variable into logical blocks and a value which can be a number value or a text string depending on the context. See below the description about common VSM configuration parameters.

1.11.1 UgCS server configuration

1.11.1.1 Listening address

Mandatory.

- **Name:** ucs.local_listening_address = [IP address]
- **Description:** Local TCP address to listen for incoming connections from UgCS server. Specify *0.0.0.0* to listen from all local addresses.
- **Example:** ucs.local_listening_address = 0.0.0.0

1.11.1.2 Listening port

Mandatory.

- **Name:** ucs.local_listening_port = [port number]
- **Description:** Local TCP port to listen for incoming connections from UgCS server. Default is 5556.
- **Example:** ucs.local_listening_port = 5556

1.11.2 Logging configuration

1.11.2.1 Level

Optional.

- **Name:** log.level = [error|warning|info|debug]

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- **Description:** Logging level.
- **Default:** info
- **Example:** log.level = debug

1.11.2.2 File path

Optional.

- **Name:** log.file_path = [path to a file]
- **Description:** Absolute or relative (to the current directory) path to a logging file. Logging is disabled if logging file is not defined. File should be writable. Backslash should be escaped with a backslash.
- **Example:** log.file = /var/opt/ugcs/log/vsm-ardupilot/vsm-ardupilot.log
- **Example:** log.file = C:\\Users\\John\\AppData\\Local\\UGCS\\logs\\vsm-ardupilot\\vsm-ardupilot.log

1.11.2.3 Maximum single file size

Optional.

- **Name:** log.single_max_size = [size]
- **Description:** Maximum size of a single log file. When maximum size is exceeded, existing file is renamed by adding a time stamp and logging is continued into the empty file. [size] should be defined as a number postfixed by a case insensitive multiplier:
  - Gb, G, Gbyte, Gbytes: for Giga-bytes
  - Mb, M, Mbyte, Mbytes: for Mega-bytes
  - Kb, K, Kbyte, Kbytes: for Kilo-bytes
  - no postfix: for bytes
- **Default:** 100 Mb
- **Example:** log.single_max_size = 500 Mb

1.11.3 Serial port configuration

Optional. VSM which communicates with vehicles via serial ports should define at least one serial port, otherwise VSM will not try to connect to the vehicles. Port name and baud rate should be both defined. [prefix] is unique for each VSM.

1.11.3.1 Port name

Optional.

- **Name:** [prefix].[port index].name = [regular expression]
- **Description:** Ports which should be used to connect to the vehicles by given VSM. Port names are defined by a [regular expression] which can be used to define just a single port or create a port filtering regular expression. Expression is case insensitive on Windows. [port index] is a arbitrary port indexing name.
- **Example:** vehicle.ardupilot.serial_port.1.name = /dev/ttyUSB[0-9]+|com[0-9]+
- **Example:** vehicle.ardupilot.serial_port.2.name = com42

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1.11.3.2 Port baud rate

Optional.

- **Name:** [prefix].[port index].baud.[baud index] = [baud]
- **Description:** Baud rate for port opening. [baud index] is an optional arbitrary name used when it is necessary to open the same serial port using multiple baud rates. [port index] is an arbitrary port indexing name.
- **Example:** vehicle.ardupilot.serial_port.1.baud.1 = 9600
- **Example:** vehicle.ardupilot.serial_port.1.baud.2 = 57600
- **Example:** vehicle.ardupilot.serial_port.2.baud = 38400

1.11.3.3 Excluded port name

Optional.

- **Name:** [prefix].exclude.[exclude index] = [regular expression]
- **Description:** Ports which should not be used for vehicle access by this VSM. Port names are defined by a [regular expression] which can be used to define just a single port or create a port filtering regular expression. Filter is case insensitive on Windows. [exclude index] is a arbitrary indexing name used when more than one exclude names are defined.
- **Example:** vehicle.ardupilot.serial_port.exclude.1 = /dev/ttyS.∗
- **Example:** vehicle.ardupilot.serial_port.exclude = com1

1.11.3.4 Serial port arbiter

Optional.

- **Name:** [prefix].use_serial_arbiter = [yes|no]
- **Description:** Enable (yes) or disable (no) serial port access arbitration between VSMs running on the same machine. It is recommended to have it enabled to avoid situation when multiple VSMs try to open the same port simultaneously.
- **Default:** yes
- **Example:** vehicle.ardupilot.serial_port.use_serial_arbiter = no

1.11.4 Network connection configuration

Optional. VSM which communicates with vehicles via network should define at least one network connection, otherwise VSM will not try to connect to vehicles. [prefix] is unique for each VSM.

1.11.4.1 Local IP-address for UDP

Optional.

- **Name:** [prefix].detector.[con index].udp_local_address = [IP-address]
- **Description:** Local IP-address to listen for incoming UDP packets on. Specify 0.0.0.0 if you want to listen on all local addresses.
- **Example:** vehicle.ardrone.detector.1.udp_local_address = 0.0.0.0

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1.11.4.2 Local UDP port

Optional.

- **Name:** [prefix].detector.[con index].udp_local_port = [port number]
- **Description:** Local UDP port to listen for incoming packets on.
- **Example:** vehicle.ardrone.detector.1.udp_local_port = 14550

1.11.4.3 Remote IP-address for UDP

Optional.

- **Name:** [prefix].detector.[con index].udp_address = [IP-address]
- **Description:** Remote IP-address to send outgoing UDP packets to.
- **Example:** vehicle.ardrone.detector.1.udp_address = 192.168.1.1

1.11.4.4 Remote UDP port

Optional.

- **Name:** [prefix].detector.[con index].udp_port = [port number]
- **Description:** Remote UDP port to send outgoing packets to.
- **Example:** vehicle.ardrone.detector.1.udp_port = 14551

1.11.5 Mission dump path

Optional.

- **Name:** [prefix].mission_dump_path = [path to a file]
- **Description:** File to dump all generated missions to. Timestamp is appended to the name. Delete the entry to disable mission dumping. All directories in the path to a file should be already created.
- **Example:** vehicle.ardupilot.mission_dump_path = C:\\tmp\\ardupilot_dump

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